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Finally, the author alone is responsible for any errors in this report.

I. INTRODUCTION

The record-keeping system of the Registrar's Office at the Naval Postgraduate School was developed piecemeal over the past 10 years as a punched-card file operation. As the student enrollment of the school increased, the punched-card files became large, unwieldy, and not conveniently accessed except by hand search. The installation of second and third-generation computers at the School only served the Registrar's data-processing needs by speeding up the printing process.

This study attempted an overall analysis of the Registrar's academic record-keeping operation from a systems point of view. The use of random access capability of disk storage was incorporated in the file organization in order to improve the present and future data retrieval needs of the school.

The design and implementation of the Registrar's information system proceeded using the following plan:

1. Analyze present system.
2. Establish objectives for new system.
3. Set output formats.
4. Establish input processing routines and command language format.
5. Program and debug new system.

6. Convert present punched-card files and implement updating procedures.
7. Test new system in parallel with present system.
8. Release new system for operation.

At the time of this report Steps 1 through 4 have been completed and are reported herein. Steps 5, 6, and 7 have all been started and are progressing. Step 6 is practically completed except for a few minor items. The feasibility of the overall system has been demonstrated by extensive computer programming. The remaining programming should be completed within three to six months by Computer Center staff personnel. Step 8 should not be attempted until the parallel run has proven the reliability and versatility of the new system.

II. ANALYSIS OF THE ORIGINAL ACADEMIC RECORD SYSTEM

The first step in the systems analysis of the record-keeping function of the Registrar's Office was the analysis of the original punched-card system. This step was further subdivided into the following investigations:

1. Organizational entities which have a bearing on the information flow of the present system.
2. The processing cycle through one academic quarter.
3. Inputs and outputs.
4. Card file organization and processing.
5. Discussions with users and providers of data (curricular officers, deans, department chairment, students, and professors).
6. Summary of problems with present system.

A. ORGANIZATIONAL ENTITIES

The organizational relation of the Registrar's Office in the academic organization of the Naval Postgraduate School is shown in Figure 1. The Registrar's Office is staffed with three full-time workers, including the Registrar, and one part-time worker. Programming assistance is provided by the Computer Center. Key punching of input data is accomplished within the Registrar's Office and occupies the full-time efforts of one worker and part-time efforts of the other workers. The other organizational entities which have a direct relationship to the information flow of

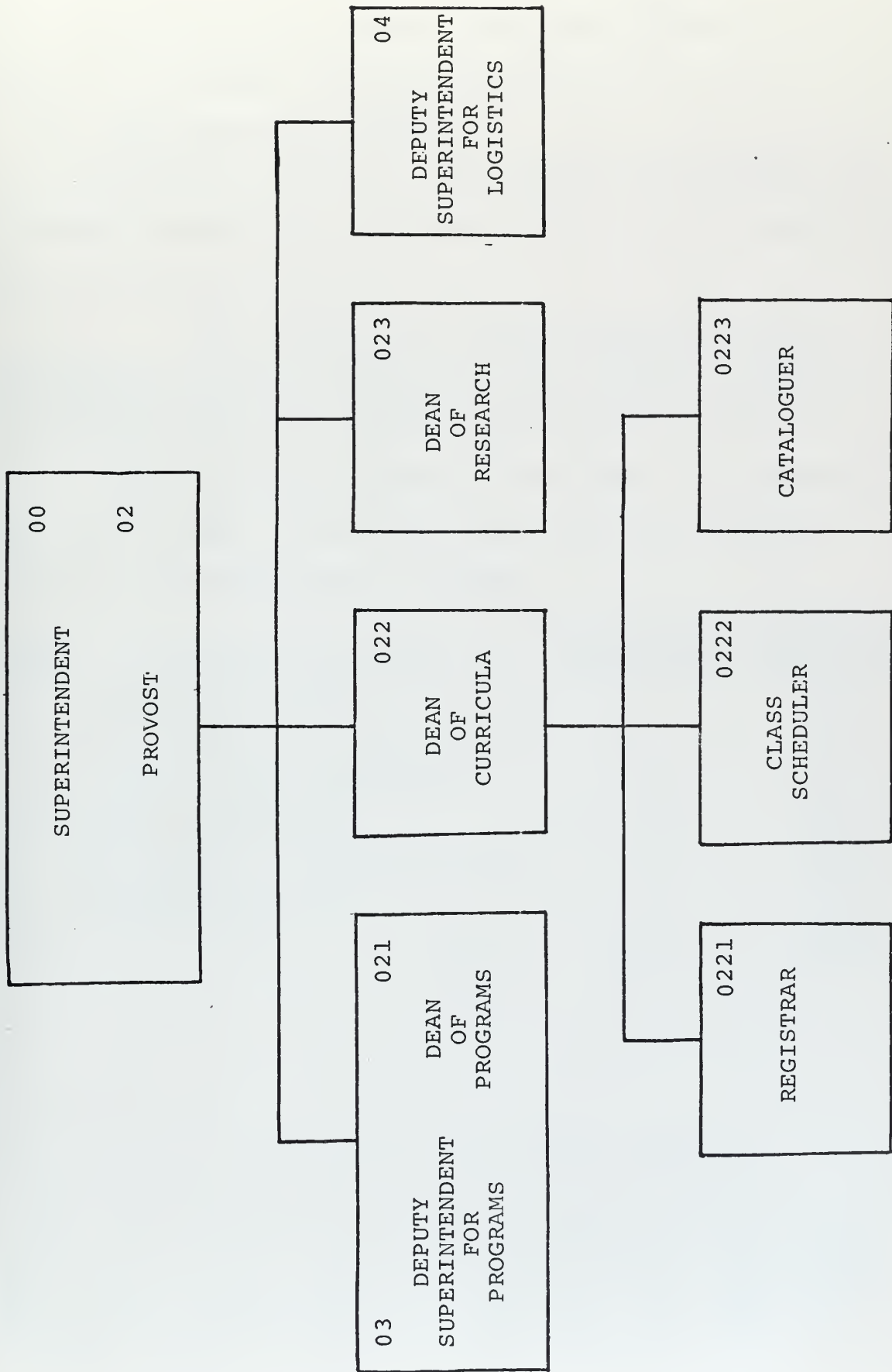


Figure 1. Academic Organization of the Naval Postgraduate School.

the Registrar's Office are the curricular officers, the academic departments, and the students.

1. The Curricular Officers

Directly reporting to the Deputy Superintendent for Programs are the nine curricular officers who are responsible for the following functions:

"(1) academic and military supervision and direction of officer students; (2) coordinating, in conjunction with Academic Associates, the elements of each curriculum within their program areas; and (3) conducting liaison with curricula sponsor representatives."¹

The curricular officers, along with their organization code, number of curricula supervised, and number of students supervised, are as follows:

<u>Code</u>	<u>Curricular Officer</u>	<u># Curricula Supervised</u>	<u># Students Supervised</u> ²
30	Operations Analysis	2	380
31	Aeronautical Engineering	1	119
32	Electronics and Communications Engineering	3	280
33	Ordnance Engineering	4	190
34	Naval Engineering	1	100
35	Environmental Sciences	2	226
36	Management & Computer Science	3	431
37	Engineering Science	1	174
38	Baccalaureate	2	343
	Totals	18	2,243

¹Naval Postgraduate School Catalogue for 1970-1972, p. 9.

²The student figures were derived from the estimated total number of students to be enrolled during Fiscal Year 1970. The source was U.S. Naval Postgraduate School, Integrated Operating and Development Plan, 1970, pp. III-1 and III-2. The figure does not include an additional 103 Immediate Graduate Education Students (IGEP's), who were also supervised by the various curricular officers.

2. The Academic Departments

The faculty of the Naval Postgraduate School is organized into eleven academic departments, each supervised by a civilian department chairman. The departments, along with their administrative code and number of professors, are as follows:

<u>Code</u>	<u>Department</u>	<u>No. of Professors</u> ³
51	Meteorology	16
52	Electrical Engineering	48
53	Mathematics	39
54	Material Science and Chemistry	13
55	Operations Analysis	42
56	Government and Humanities	12
57	Aeronautics	22
58	Oceanography	16
59	Mechanical Engineering	15
61	Physics	30
62	Business Administration and Economics	33
	Total	286

3. The Officer Students

The large majority of students at the Naval Postgraduate School are student officers ordered to the school by the Navy, Marine Corps, Coast Guard, Army, Air Force, and twenty-three allied nations. In addition, a few members of the civilian and military staff attend and obtain academic credit for courses. The Aviation Safety Program, also conducted by the Naval Postgraduate School, normally convenes

³The number of professors was derived from a list of all professors who have taught courses during the first three quarters of fiscal year 1970-1971. This list was used to set up the master professor file discussed in Section VI of the thesis.

four classes per year of about twenty-five students each. The Registrar maintains academic records for them as well.

The military officers attending classes are organized into military sections by their assigned curricular officers, and most administrative business is conducted via the senior member of each student section. Each student is also assigned a Student Mail Center (SMC) box and is expected to pick up his mail once each working day.

4. Organizational Changes

The organizational entities described above represent a structure at only one point in time. This structure is undergoing gradual change, and any data processing system should be designed to cope with these changes. For example, the number of academic departments increased from ten to eleven over the past two years. The merger of two academic departments is planned for 1 July 1971. The estimated average on board student loading is planned to increase by fifty-six during Fiscal Years 1973-1978,⁴ and the number of professors is planned to be increased by forty-seven during this same period.⁵

B. ACADEMIC QUARTER PROCESSING CYCLE

The fifty-two weeks of one academic year are divided into four academic quarters of twelve weeks each, plus two

⁴Ibid., p. III-3

⁵Ibid., p. IV-2.

inter-quarter breaks of two weeks each. These breaks are scheduled for July and December of each year. Final examinations are scheduled during the twelfth week of each quarter. The academic year begins in July, and the successive quarters are numbered 1, 2, 3, and 4. For computer processing purposes the quarters are prefixed by a two-digit year. For example, Quarter 701 was the first quarter of academic year 1970-1971, Quarter 703 is the current academic quarter, which convened in January, 1971, and ends in March, 1971. Because there was no inter-quarter break in September, 1970, Quarters 701 and 702 are designated "back-to-back" quarters. Similarly, Quarters 703 and 704 will be "back-to-back."

An officer student normally attends classes in successive quarters from the time he commences his curriculum study until he completes his degree requirements or is awarded a certificate of course completion. The time of study varies, depending on the curricula, from four to eighteen quarters. The median student is on board for six quarters. New students arrive each quarter, and there is a graduation and awarding of degrees once each quarter.

The basic processing cycle of the Registrar is one quarter but proceeds over a period of more than one calendar quarter. At any one point in time there is processing underway for more than one quarter, the actual schedule depending on whether the quarter is a back-to-back or not.

The following is a description of overall operations of the original punched-card system.

1. Week 9: Roster Letter

A listing of all students in the master card file was sent to the curricular officers for updating during the ninth week. Under the original system this was the main updating device used to correct student information such as section assigned and change of rank. The primary purpose of the list, however, was to verify the students who were expected to graduate at the end of the next academic quarter. These potential graduates were identified by the curricular officer with a check mark opposite the student name. After the roster letters were returned to the Registrar, the student master file was updated with the changes, and the cards for the potential graduates pulled by hand and placed in a separate group.

2. Week 10: Preliminary Input List

Based on copies of student orders to the school and also on information returned by the curricular officers on the roster letter, a list of new students was published. Thirteen copies of this list were distributed.

3. Week 12: New Quarter Course and Header Cards

During the last week of each quarter six registration cards were prepared for each student expected to be on board for the next quarter. These cards contained quarter number, section number, officer file number, designator, rank, corps/country code, alpha sequence number, and student

name. Potential graduate cards were produced with a distinguishing color. These cards were distributed via the curricular officers and section leaders to the students on or before the first day of classes. They were turned in by the students to the professors of each course in which they should be registered. The actual schedule for each student was determined by the curricular officer in conjunction with the Master Schedule of Classes published by the Class Scheduler. Under the original system the student actually registered himself by handing in one of these course cards.

Also during the twelfth week, or as soon as the Master Schedule of Classes was published, header cards for each course segment scheduled were prepared and distributed to the academic departments. These header cards were combined by the secretaries of the various departments with the student course cards turned in by the instructors and all were returned to the Registrar during the first, second, and third weeks of the new quarter.

4. Week 2: Temporary Class Rosters

From the class header cards and student (detail) cards turned in by the academic departments, preliminary class rosters were prepared. The course information (course name, course number, segment number, lecture hours, and lab hours) from the header card was duplicated onto the detail (student) cards. The groups of header and detail cards were manually filed in a group by course number. These cards new made up the current quarter's registration file. A complete file for one quarter constituted about 7000 cards.

5. Week 3: Permanent Class Rosters

Two copies of the Temporary Class Roster were produced from the original course cards and sent to the instructor. One copy was retained for the instructor's use in administering the class. The second copy was verified by the instructor and returned to the Registrar with any corrections noted. The punched cards were updated with the corrections, and 3 copies of the Permanent Class Roster produced, 2 for the instructor and one for the Dean of Programs.

6. Week 5: Potential Graduates List and On Board List

Eighteen copies of the list of potential graduates were produced and distributed. Thirty copies of the on board list were produced and distributed. Each list contained file number, designator, rank, corps/country code, name, and education code (four digits). The lists were titled with the as-of date and page number. A total number of students on the list appeared at the end.

7. Week 9: Incomplete Grade Reminders

A memorandum was sent to all students who had incomplete grades outstanding from the previous quarter, with a copy to each curricular officer and professor. All incomplete grades had to be changed to a letter grade by the end of the twelfth week, or else they were administratively changed to failure.

8. Week 11: Grade Rosters

Another copy of the class roster was produced from the registration file in order for the instructors to report

the course grades. This copy was distributed via the academic departments and was required to be returned no later than 1000 on Monday following the end of the quarter (twelfth week). Although early submission of grades was encouraged, the great bulk of the grade rosters were actually turned in between 0800 and 1000 of the last possible day.

9. Week 1: Grades and Transcripts

The first week following the end of the quarter was the peak processing time for the Registrar. While the grade rosters were being received, the course cards were manually pulled from the registration file and placed in the key-punch. An alphabetic grade was keypunched on each student card from the grade roster. As course segments were finished, they were placed in a processing tray, taken to the computer center, and an official roster (with printed grade) was produced for verification by the instructor.

During Week 10 or 11, the student cards for the potential graduates were manually pulled and placed in a "quick processing" bin. The potential graduate cards in most cases were identified by a different color stripe. After all the courses were keypunched with grades and the official rosters run, then these cards were alphabetically sorted and assembled with the grade cards from previous quarters. It was only at this point that grade reports for graduates in the form of an academic record could be produced. These academic records with the final quality point averages for the graduates were an essential item that must

have been completed before the Academic Council could convene for the recommendation of degree awards. Until the second quarter of Academic Year 1970-1971, the Academic Council met at 1300 on Tuesday following the end of a quarter. Graduation was held the following Wednesday morning. Commencing with the second quarter of Academic Year 1970-1971, the graduation ceremony was held on Friday of the last day of the quarter. The actual awarding of degrees was accomplished after the Academic Council met later in the first week following the end of the quarter. While late-night work to produce the academic records was no longer required, there was still considerable pressure to meet the Academic Council deadline and to get the grades published for all students, as well.

Academic records were produced on three-part colored paper. The white original was filed alphabetically by student name in the Registrar's files and was used to produce all official copies. The second (yellow) copy and the third (pink) copy were both forwarded to the curricular officer. The yellow copy was retained by the curricular officer for the student's file, and the pink copy was forwarded via the section leaders to the students.

The official class rosters (with printed grades) were forwarded to the academic departments for verification and were filed in the Course Journals maintained by each department.

